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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/089,528	07/02/2002	Ekkehard Pott	070255.0624	7313

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EXAMINER

SOLIS, ERICK R

ART UNIT	PAPER NUMBER
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3747

DATE MAILED: 06/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/089,528

Applicant(s)

POTT ET AL.

Examiner

Erick R. Solis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 12-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 12-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 12-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takaku et al (US Pat. No. 6330510) in view of applicant's admitted prior art at pg.3, paragraph 9 of the specification. This reference teaches a direct injection Otto engine having a stratified lean mode (layered lean) wherein NO<sub>x</sub> emissions are reduced by using a NO<sub>x</sub> storage catalyst. The engine also includes an external EGR system (not shown). Furthermore a control valve (7) which may be used to generate a tumbling flow is taught. This reference, however, does not teach the use of internal EGR. Applicant teaches at paragraph 9 of the specification, that similar engines are

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known which simultaneously use internal and external EGR. It would have been obvious to one of ordinary skill in the art to have included internal EGR in Takaku et al 's engine because this would have provided for more accurate distribution of EGR to all the cylinders and reduced delay times. Furthermore, the use of an EGR cooler is considered to be an obvious matter of design choice as they are well know in the art and would have aided in further lowering NOx emissions by reducing combustion temperatures. The use of an NOx sensor is also well known and would have aided in further refining control of the NOx emissions.

4. Claims 12-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishimura et al (US Pat. No. 6257197) in view of applicant's admitted prior art at pg.3, paragraph 9 of the specification. This reference teaches a direct injection Otto engine having a stratified lean mode (layered lean) wherein NOx emissions are reduced by using a NOx storage catalyst. The engine also includes an external EGR system (38). Furthermore a control valve (30) which may be used to generate a tumbling flow is taught. This reference, however, does not teach the use of internal EGR. Applicant teaches at paragraph 9 of the specification, that similar engines are known which simultaneously use internal and external EGR. It would have been obvious to one of ordinary skill in the art to have included internal EGR in Nishimura et al 's engine because this would have provided for more accurate distribution of EGR to all the cylinders and reduced delay times. Furthermore, the use of an EGR cooler is considered to be an obvious matter of design choice as they are well know in the art and would have aided in further lowering NOx emissions by reducing combustion temperatures. The use of an NOx sensor is also well known and would have aided in further refining control of the NOx emissions.

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5. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takaku et al (US Pat. No. 6330510) in view of applicant's admitted prior art at pg.3, paragraph 9 of the specification, and further in view of either of Wolters et al or Lippert. Takaku et al teach a direct injection Otto engine having a stratified lean mode (layered lean) wherein NOx emissions are reduced by using a NOx storage catalyst. The engine also includes an external EGR system (not shown). Furthermore a control valve (7) which may be used to generate a tumbling flow is taught. Takaku et al, however, do not teach the use of internal EGR. Applicant teaches at paragraph 9 of the specification, that similar engines are known which simultaneously use internal and external EGR. It would have been obvious to one of ordinary skill in the art to have included internal EGR in Takaku et al 's engine because this would have provided for more accurate distribution of EGR to all the cylinders and reduced delay times. Furthermore, the use of an EGR cooler is considered to be an obvious matter of design choice as they are well known in the art and would have aided in further lowering NOx emissions by reducing combustion temperatures. The use of an NOx sensor is also well known and would have aided in further refining control of the NOx emissions. Regarding the structure of the tumble plate (it should be noted that applicant's disclosure regarding this structure is somewhat vague and the drawing is not very detailed regarding structure) both Wolters et al and Lippert teach a tumble valve which can be laid against a wall of an inlet channel to allow air to pass freely through or can be set to provide a tumbling motion to the incoming air. It would have been obvious to one of ordinary skill in the art to have substituted a tumble control valve, as taught by Wolters et al or Lippert et al for valve (7) of Takaku et al 's engine, as they are essentially functional equivalents.

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6. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishimura et al (US Pat. No. 6257197) in view of applicant's admitted prior art at pg.3, paragraph 9 of the specification, and further in view of either of Wolters et al or Lippert. Nishimura et al teach a direct injection Otto engine having a stratified lean mode (layered lean) wherein NOx emissions are reduced by using a NOx storage catalyst. The engine also includes an external EGR system (38). Furthermore a control valve (30) which may be used to generate a tumbling flow is taught. Nishimura et al, however, do not teach the use of internal EGR. Applicant teaches at paragraph 9 of the specification, that similar engines are known which simultaneously use internal and external EGR. It would have been obvious to one of ordinary skill in the art to have included internal EGR in Nishimura et al 's engine because this would have provided for more accurate distribution of EGR to all the cylinders and reduced delay times. Furthermore, the use of an EGR cooler is considered to be an obvious matter of design choice as they are well know in the art and would have aided in further lowering NOx emissions by reducing combustion temperatures. The use of an NOx sensor is also well known and would have aided in further refining control of the NOx emissions. Regarding the structure of the tumble plate (it should be noted that applicant's disclosure regarding this structure is somewhat vague and the drawing is not very detailed regarding structure) both Wolters et al and Lippert teach a tumble valve which can be laid against a wall of an inlet channel to allow air to pass freely through or can be set to provide a tumbling motion to the incoming air. It would have been obvious to one of ordinary skill in the art to have substituted a tumble control valve, as taught by Wolters et al or Lippert et al for valve (30) of Nishimura et al 's engine, as they are essentially functional equivalents.

***Response to Arguments***

7. Applicant's arguments filed 16 March 2005 have been fully considered but they are not persuasive. In particular, applicant's arguments regarding the 35 USC 103 rejection of all of the claims as being obvious over Nishimura et al in view of the admitted prior art or alternatively as being obvious over Takaku et al in view of the admitted prior are not found to be persuasive. Applicant's argument against both combinations of the primary references Nishimura et al and Takaku et al with the admitted prior art of pg.3, paragraph 9 is that these combinations do not teach swirling of the incoming gas wherein the swirl has an axis which is **transverse** to the axis of the piston. The type of swirling which applicant is describing is commonly referred to in the art of internal combustion engines as a **tumbling** flow. In a tumbling flow the swirl axis is transverse to the axis of the piston. **Swirling** flow in distinction to tumbling flow rotates about an axis which coincides with the piston axis. Both of the primary references refer to tumbling flow. Applicant's admitted prior art of pg. 3 paragraph 9 is pasted below:

[0009]The advantages described of internal exhaust-gas recirculation are utilized in the first direct injection DI Otto engines found on the market, which in addition to external exhaust-gas recirculation also have internal exhaust-gas recirculation with intake camshaft displacement and exhaust-gas purification by means of Nox storage catalysts. For mixture formation in these internal combustion engines, a swirl concept is used for charging, in which a rotational movement is imparted to the drawn-in gases in the cylinder, the axis of rotation running approximately parallel to the piston movement/cylinder axis. **At the same time, a vertical swirl is produced in the combustion**

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**chamber, into which the stream of fuel is injected and conveyed to the spark plug. In conjunction with a Nox storage catalyst, such combustion processes already have quite low Nox emissions. ”**

Note the bolded section above, which also refers to what would seem to imply tumbling flow, “ a vertical swirl is produced”. Please also note newly cited reference 20020144671 to Shiraishi et al which at paragraph 136, line 30, states the following :

“A **tumble flow** concentrated in the combustion chamber turns to a stratum of air flow on the piston 12, producing an air wall. The fuel spray is conveyed in the direction of ignition plug by this air flow. Further, the fuel spray is prevented from sticking to the piston top face because it is guided by the air wall. This system is referred to as a tumble air guide system. The spray shape and the injection direction of the fuel spray are set so that the fuel spray easily reaches the periphery of a plug gap of the ignition plug 28. ”

See also Figs. 33-35 of this reference which depict the tumbling flow having the orientation claimed. This reference is merely being relied upon to teach what is already known to one of ordinary skill in the art regarding the orientation of tumble flow.

Furthermore, the subsequent charging motion of the piston would inherently cause an intermixture of residual exhaust gases in any engine having internal EGR. For the reasons above the rejection is being maintained.



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***Conclusion***

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erick R. Solis whose telephone number is (571) 272-4853. The examiner can normally be reached on Monday-Thursday.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-3700.



Erick R Solis  
Primary Examiner  
Art Unit 3747

ers  
June 9, 2005